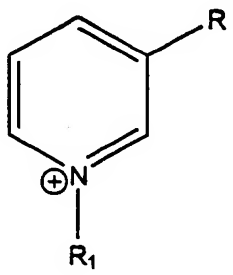
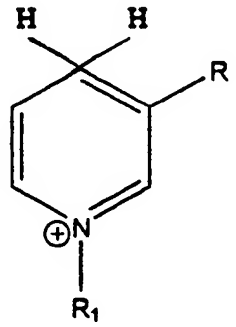
What is Claimed

1. A composition for replacement of NAD(P)$^+$/NAD(P)H in oxido-reduction enzymatic reactions comprising a compound of general formula I in a combination with its 1,4-reduced form compound (II)



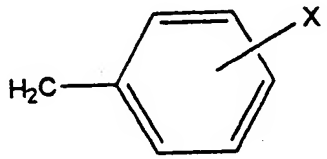
(I) and



(II)

wherein R is -CN, $-C(O)NH_2$, $-C(O)NHCH_3$, $-C(S)NH_2$, $-C(O)CH_3$ or $-C(O)OCH_3$;

wherein R_1 is $-(CH_2(CH_2O)_n YR_2$, ribose-Y-R_2 or



wherein Y is -OPOO-, $-OBO_2-$, $-OSO_2-$, CH_3NH-, $-(CH_2)_nNH-$, adenine, or imidazole;

R_2 is H, CH_3, $-(OCH_2CH_2)_n$, $-(NCH_2CH_2)_n-$ or $-[(N=P(OCH_3)_2]_n$;

wherein X is $-OCH_3$, $-CF_3$, $-O(CH_2CH_2O)_n$ or $-OPOOR_2$;

wherein R_3 is H, $-CH_3$, $-(OCH_2CH_2)_n$, $-(NCH_2CH_2)_n-$ or $-[N=P(OCH_3)_2]_n$;

wherein n is 1-2000; chloride, bromide, sulphate, phosphate, nitrate,

or a salt thereof.

2. The composition of claim 1 wherein the compound is β-nicotinamide-5-ribose methyl phosphate compound (6) and its reduced form is 1,4-dihydronicotinamide-5-ribose methyl phosphate compound (7).

3. The composition of claim 2 wherein the compound in combination with its 1,4-reduced form is tethered to a polymer matrix.

4. A device for replacement or regeneration of $NAD(P)^+/NAD(P)H$ system in oxido-reductive processes comprising

a) a polymer matrix;

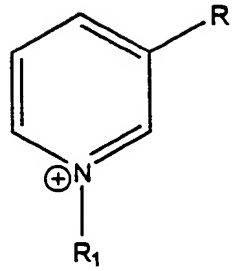
b) a catalyst precursor;

c) a co-factor; and

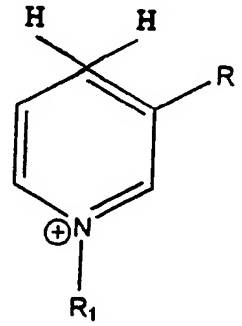
d) an enzyme.

5. The device of claim 4 wherein the co-factor is NAD^+, $NADP^+$ or a biomimic compound of the formula I or II

(I)

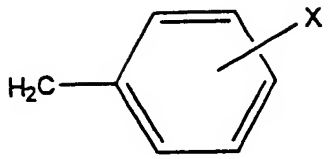


(II)



wherein R is -CN, $-C(O)NH_2$, $-C(O)NHCH_3$, $-C(S)NH_2$, $-C(O)CH_3$ or $-C(O)OCH_3$;

wherein R_1 is $-(CH_2(CH_2O)_n YR_2$, ribose-Y-R_2, or



wherein Y is -OPOO-, $-OBO_2-$, $-OSO_2-$, CH_3NH-, $-(CH_2)_nNH-$, adenine, or imidazole;

R_2 is H, CH_3, $-(OCH_2CH_2)_n$, $-(NCH_2CH_2)_n-$ or $-[(N=P(OCH_3)_2]_n$;

wherein X is $-OCH_3$, $-CF_3$, $-O(CH_2CH_2O)_n$ or $-OPOOR_2$;

wherein R_3 is H, $-CH_3$, $-(OCH_2CH_2)_n$, $-(NCH_2CH_2)_n-$ or $-[N=P(OCH_3)_2]_n$;

wherein n is 1-2000; or a salt thereof.

6. The device of claim 5 wherein the co-factor is the biomimic used for replacement of NAD(P)$^+$/NAD(P)H system.

7. The device of claim 6 wherein the biomimic is in combination with its 1,4 reduced derivative.

8. The device of claim 7 wherein the catalyst precursor is rhodium, zinc, nickel, cobalt, iridium or ruthenium comprising complex.

9. The device of claim 8 where the catalyst precursor is rhodium comprising complex.

10. The device of claim 9 wherein the catalyst precursor is [Cp*Rh(bpy)(H_2O)] triflate salt.

11. The device of claim 8 additionally comprising a reducing agent.

12. The device of claim 11 wherein the reducing agent is formate, hydrogen, sodium borohydride, hydroguinone, sodium borohydrate, and electrode or a photon.

13. The device of claim 14 wherein the enzyme is oxidase or reductase.

14. A method for replacement of $NAD(P)^+/NAD(P)H$ in oxido-reduction enzymatic reactions comprising a step of replacing $NAD(P)^+/NAD(P)H$ co-factors with a biomimetic composition of claim 1.

15. The method of claim 14 comprising a step of reacting a substrate in the presence of oxidase or reductase and the composition comprising an oxidized and reduced form of the biomimic.

16. The method of claim 15 further comprising a catalyst precursor providing a hydrid.

17. The method of claim 16 wherein the catalyst is $[Cp^*Rh(bpy)(H_2O)]$ triflate salt.

18. A catalyst precursor comprising rhodium, iridium, zinc, cobalt, nickel or ruthenium.